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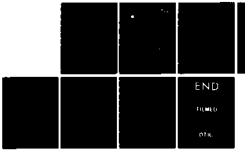

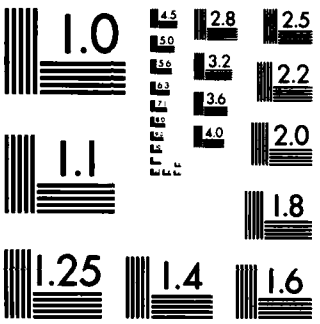

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J. T. STEVENS

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AN AUTOMATED INFORMATION SYSTEM: RESULTS AFTER FOUR YEARS

J. V. CARON*

J. T. STEVENS**

Research Progress Report NDRI-PR-85-02
Work Unit 63706N M0095003.3028
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G. E. CLARK
Captain, Dental Corps
United States Navy
Commanding Officer

The primary function of the Navy Dental Corps is to provide dental care for active duty Navy and Marine Corps personnel to ensure their readiness for extended combat commitments. Optimum oral health should be maintained so that the sequelae of dental disease will not interfere directly or indirectly with the performance of military duties (1).

Dental caries and periodontal disease are chronic degenerative diseases of the oral tissues with progressive and cumulative deleterious effects. These characteristics make the early treatment and prevention of oral diseases highly desirable and cost-effective. In addition, the unique mission of the U.S. Navy, patrolling the high seas for extended periods, makes the management of dental casualties a serious concern in avoiding mission-degrading situations.

Current research among the active duty Navy population indicates that five percent of the recruit population manifests 22 percent of the dental caries and that this same five percent exhibits 40 percent of subsequent dental caries once in the fleet (2). It is estimated that a relatively small portion of the active duty population (20 percent) uses 80 percent of the dental resources (3). Timely identification of this high-risk population, along with intensive preventive measures and early dental treatment, is essential and provides the background for the Navy preventive dentistry program (1).

Caron et al. (4,5) have described an automated dental recall and information system for the Pearl Harbor, Hawaii, region. The primary objective of this system, which was started in 1980, is to provide unit commanding officers with the information and patient data required to administer the Navy preventive dentistry program more effectively for all Navy and Marine Corps personnel in the Pearl Harbor region. The purpose of this article is to describe the current status of the project and to examine its effect on dental readiness after four years.

SYSTEM DESCRIPTION

The Naval Dental Clinic, Pearl Harbor, provides complete dental care to about 25,000 active duty personnel stationed in the Hawaii region as well as to numerous operational units transiting the Pacific region. A staff of 42 Dental Corps officers, three Medical Service Corps officers, 84 dental technicians, and 13 civilian personnel operate the headquarters clinic and seven remote branch dental clinics. The population comprises 110 shore-based commands consisting of 10,600 Navy and 500 Marine Corps personnel. Deploying forces are attached to 56 separate units. Among the personnel of these units are 5,660 assigned to surface ships, 2,300 to submarines, and 2,800 to aviation units. The ratio of dentists to the population served is 1:520.

The data base for the automated dental recall and information system consists of specific information from individual dental

records stored on magnetic disks according to the final four digits of a patient's social security number. Information is updated daily as treatment is rendered and as changes are received from outlying dental clinics.

Several facets of a patient's oral health care are monitored: dental examination status, dental classification (Table 1), previous dental classification, and the need for specific dental treatment; i.e., preventive dentistry, operative dentistry, periodontics, endodontics, oral surgery, or prosthodontics.

The system generates periodic, standardized reports to aid in dental management. The command recall list (Figure 1) identifies personnel who need an annual dental examination or who require dental treatment. This report is forwarded to unit commanding officers every month. The number of months a person is overdue for an annual examination and the type of treatment required are indicated in the last seven columns of the list. Once patients are identified, their names remain on the recall list until removed by the dental clinic. Personnel thus attain a high level of visibility within their command, which translates into higher recall compliance and treatment rates.

The command master list (Figure 2) is also furnished to each operational unit every month. The report verifies the names and dental data of all personnel for whom the dental clinic has dental records. Commanding Officers are requested to annotate and return the list to maintain accuracy. Good communication between dental clinic liaison personnel and unit dental representatives ensures a high degree of compliance.

The enforcement of a check-in/check-out requirement for arriving and departing personnel and the months overdue feature (Figure 1) increase the likelihood that records held by the dental clinic truly reflect the population served. Recent validation surveys show an error rate of less than 1 percent. A master list, arranging data according to the last four digits of a patient's social security number, facilitates the verification of the actual records held by the dental clinics and the operational units.

Weekly management reports (Figure 3) are provided to all branch dental clinics. Fleet/shore dental officers use this information to monitor and manage the oral health status of personnel assigned to each unit, and dental clinic managers can use the data to monitor the efficiency of their clinics.

Program development, equipment, and support for the dental recall and information system are provided by the Navy Data Automation Facility, Pearl Harbor, on a Navy Industrial Fund basis. Three online terminals, each consisting of a keyboard and a CRT screen monitor, are placed at the headquarters dental clinic. Two terminals are located at the front desk, where most of the updating activity takes place. The third is located in the fleet/shore liaison office, where input from outlying clinics and

operational units is entered. The terminals are linked to a Univac 1100 mainframe computer that performs all the procedures necessary to run the project. A small character printer generates onsite ad hoc reports at the request of dental clinic personnel. The cost of running the system is about $0.13 per active duty patient per month compared with $24 per patient per year for overall naval dental clinic operations.

The system's major function is the periodic dental recall of patients and the identification of personnel who do not respond to treatment calls. However, the data base created can supply vital information for use in the management of dental resources and personnel, the evaluation of oral health programs, and the more effective planning of assets by fleet and shore operational units.

RESULTS

Dental readiness (classes 1 and 2) percentages for Naval Dental Clinic, Pearl Harbor, from 1980 through 1983 are depicted graphically in Figure 4. There has been a 30 percent improvement in dental readiness over the past four years. When plotted for operational units (afloat) and support units (ashore), the trend is evenly distributed (Figure 5). This indicates that although treatment priority must be given to deploying units, it is possible, with good planning and management, to establish and maintain a high level of dental readiness for all active duty operational and support forces.

Changes in the distribution of dental classifications (Table 2) show that the greatest increase was observed in dental personnel who required no treatment (class 1). This is consistent with the finding that the number of class 4 personnel examined and found to require early treatment (class 3) had declined from 71 percent in 1980 to 37 percent in 1983. It should be pointed out that during this period the dental health of incoming Navy personnel was improving as a result of the reduced rate of dental caries experienced by American children since the widespread adoption of fluoride dentifrices. Nevertheless, the rise in Navy dental readiness can be attributed in part to the automated dental information system.

One of the more useful features of the dental recall and information system is the timely identification of treatment needs among class 3 personnel. Whereas the overall class 3 population declined from 19.5 percent in 1981 to 12 percent by the end of 1983, the percentage of class 3 personnel requiring dental treatment (Table 3) increased in all areas except operative dentistry. Workload statistics for the 1981-1983 period reflect this trend, exhibiting a combined 25.3 percent increase in periodontic, endodontic, and oral surgery procedures, along with a combined 16.2 percent decrease in operative and prosthodontic procedures.

DISCUSSION

The implementation of the Pearl Harbor dental recall and information system and the subsequent improvement in dental health of the Navy and Marine Corps forces in the Hawaii area is noteworthy. Automation has provided dental clinic management personnel with the data and analytic capability required for day-to-day operations, budgeting, and planning. It has facilitated better patient care by providing dental information that is accessible, easily retrievable, legible, and well organized.

An effective dental recall and information system cannot be achieved solely by installing computerized equipment. The establishment of an aggressive fleet/shore dental liaison program is essential to increased awareness among operational units that dental care is an integral part of Navy mission-readiness objectives. Spearheaded by senior dental officers, this program has been accepted by unit commanding officers as a modern, effective tool for the management of the dental health of their personnel. As a result of frequent validation inspections, close coordination of dental appointments with Medical Department representatives afloat, and the inclusion of dental readiness status in command briefings, several units have left the area with 100 percent dental readiness. In the submarine force, where mission preparedness is vital, a 90 percent overall dental readiness has been achieved.

The fleet/shore dental liaison program was considered essential because of the frequent transfer of personnel from support units to the operational forces. A communications network was established between the dental clinics and commands that support the fleet. Shore command representatives work closely with a shore dental liaison desk, which has functions similar to those of the fleet/force desk. A key factor in the increased readiness of these units has been the emphasis on immediate examination and early treatment for all incoming personnel upon dental record check-in.

CONCLUSION

The automation of dental record information and the establishment of a viable fleet/shore dental liaison program has facilitated the timely identification of personnel in greatest need of dental treatment. The system has provided dental information about personnel and organization units that has motivated line commanding officers to support dental recall and treatment programs. The most significant outcome of this system has been a documented improvement in the general dental health of the population served, which equates with a higher state of personnel combat readiness.

Other automated dental information systems are being planned. The system at the Naval Dental Clinic, Pearl Harbor, shows that improved dental health is possible through a more effective management of existing personnel and administrative resources.

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*Head, Preventive Dentistry Department, Branch Dental Clinic, Washington Navy Yard, Washington, D. C. 20374-1661.
**Director, Dental Care Division, Naval Medical Command, Washington, D. C. 20372.

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TABLE 1. DENTAL CLASSIFICATIONS*

Class	
1	Individuals having no pathological oral conditions and requiring no treatment other than routine preventive measures.
2	Individuals with minor pathological oral conditions, the treatment of which may be considered routine and not required for a period of 12 months.
3	Individuals with pathological oral conditions for which early treatment is indicated.
4	Individuals whose classification is unknown because they have not received an oral examination within the past 12 months or for whom no dental record exists.

*From MANMED, art. 6-101.

TABLE 2. PERCENTAGE OF PERSONNEL BY DENTAL CLASSIFICATION (N = 22,300)

Class	Jan 81	Jan 84	% Change
1	39.5	57.0	+17.5
2	22.0	23.0	+1.0
3	19.5	12.0	-7.5
4	19.0	8.0	-11.0

TABLE 3. NUMBER OF CLASS 3 PERSONNEL BY TREATMENT NEEDED

Treatment Needed	Mar 81 (N = 4349)	Dec 83 (N = 2676)	% Change
Operative	3,740 (86)	2,301 (86)	0
Periodontics	304 (7)	401 (15)	+8
Endodontics	217 (5)	241 (9)	+4
Oral Surgery	522 (12)	455 (17)	+5
Prosthodontics	217 (5)	268 (10)	+5

Percentages given in parentheses.

NAVAL DENTAL CLINIC PEARL HARBOR
AFLOAT COMMAND RECALL (SAMPLE)
JANUARY 1984

CLINIC- FORCES AFLOAT
COMMAND- 01234 USS EVERSAIL-DDG 01 COMBAT READINESS - 64 %

NAME	RANK	SSN	DENTAL EXAM DATE	CLASS CHANGE	DENTAL CLASS	EXAM	MONTHS OVERDUE	PREV	OPER	PERI	ENDO	SURG	PROS
BROWN ROBERT F	HTC	D	0382	0483	4	X	10	X	X			X	
GREEN ROY H	SR	E	0783	0783	3		0	X	X				
JONES JAMES J	LT	L	0883	0883	3		0						X
MACBRIDE DAVID A	BM3	E	0983	0983	2		0	X					
QUINN FREDERICK G	PNSN	T	1183	1183	3		0		X		X		
SMITH JOHN L	MS1	E	0482	0583	4	X	9	X					
WARD RICHARD L	HM2	D	0183	0183	1	X	0						
UIC 01234 RECALL TOTALS					7	3		4	3		1	1	1

CLASS 1 = 1
CLASS 2 = 1
CLASS 3 = 3
CLASS 4 = 2

Figure 1. Monthly command recall list. The "months overdue" column applies only to yearly examinations. The number of months overdue automatically increases each month until the patient reports for examination. The dental class is automatically changed to class 4 thirteen months after the last examination.

NAVAL DENTAL CLINIC PEARL HARBOR
MASTER LIST (CLINIC, UIC, NAME)
10 JANUARY 1984

CLINIC- FORCES AFLOAT (SAMPLE)
COMMAND- 01234 USS EVERSAIL-DDG 01

COMBAT READINESS - 64 %

NAME	WORK CENTER	RANK	SSN	EXAM DATE	CLASS CHANGE	DENTAL CLASS	UIC	PREV	OPER	PERI	ENDO	SURG	PROS
BROWN ROBERT F		HTC	D	0382	0483	4	01234	X	X			X	
GRAY PHILLIP T		LTJG		0683	0683	1	01234						
GREEN ROY H		SR	E	0783	0783	3	01234	X	X				
HALL JERRY R		ENCS		0383	0383	1	01234						
JONES JAMES J		LT	L	0883	0883	3	01234						X
KISSINGER CLYDE J		SKC		0583	0583	1	01234						
MACBRIDE DAVID A		DN3	E	0983	0983	2	01234	X					
MAXWELL RONALD T		SN2		0783	0783	1	01234						
QUINN FREDERICK G		PHSN	T	1183	1183	3	01234		X		X		
SMITH JOHN L		MS1		0482	0583	4	01234	X					
SMITH MANUEL K		CDR	E	0683	0683	1	01234						
STEWART JIMMIE L		BMC		1183	1183	1	01234						
WARD RICHARD L		HN2	D	0183	0183	1	01234						
WHITE RALPH S		MS1		1283	1283	1	01234						
UIC 01234 TOTALS						14		4	3		1	1	1

CLASS 1 = 8
CLASS 2 = 1
CLASS 3 = 3
CLASS 4 = 2

Figure 2. Monthly command master list. The "combat ready" percentage is for personnel in classes 1 and 2.

DATE RUN 10 JANUARY 1984

NDC WEEKLY PERCENT REPORT (SAMPLE)
BARBERS POINT CLINIC % REPORT

ORGANIZATION	UIC	ASSIGNED	CL1	CL2	CL3	CL4	%1	%2	%3	%4	TOTAL	READY PCT
USS EVERSAIL - DDG 01	01234	14	8	1	3	2	57	7	22	14	36	64
USS NEVERSAIL - DDG 02	12345	30	21	5	3	1	70	17	10	3	13	87
USS FLATBOTTOM - FF01	23456	110	58	19	14	19	53	17	13	17	30	70
USS BIGSTRIKE - SSN 03	34567	187	93	56	31	7	50	30	17	4	21	79
PATROL SQUADRON ZERO	45678	108	66	26	8	8	61	24	7	7	14	86
PATROL SQUADRON BRAVO	56789	139	83	26	15	15	60	19	11	11	22	78
% TOTAL BARBERS POINT CLINIC		588	329	133	74	52	56	23	13	9	21	79

Figure 3. Weekly management report.

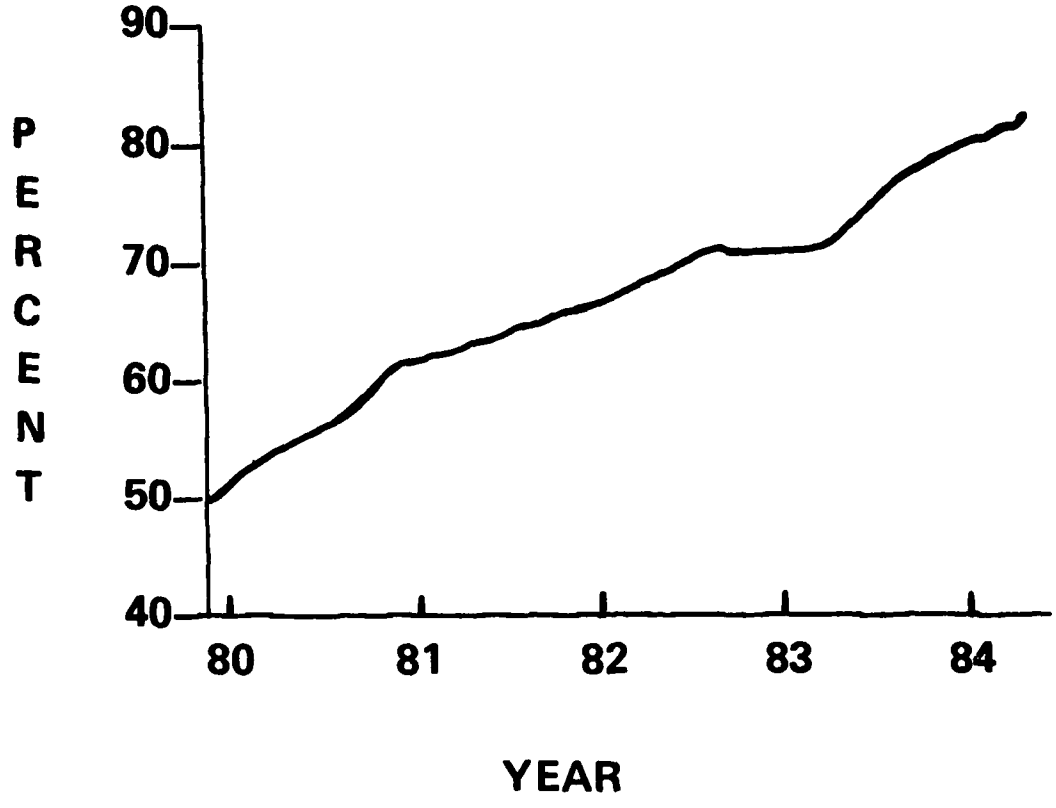

Figure 4. Total dental readiness (personnel in classes 1 and 2), Naval Dental Clinic, Pearl Harbor. Total forces = 22,300.

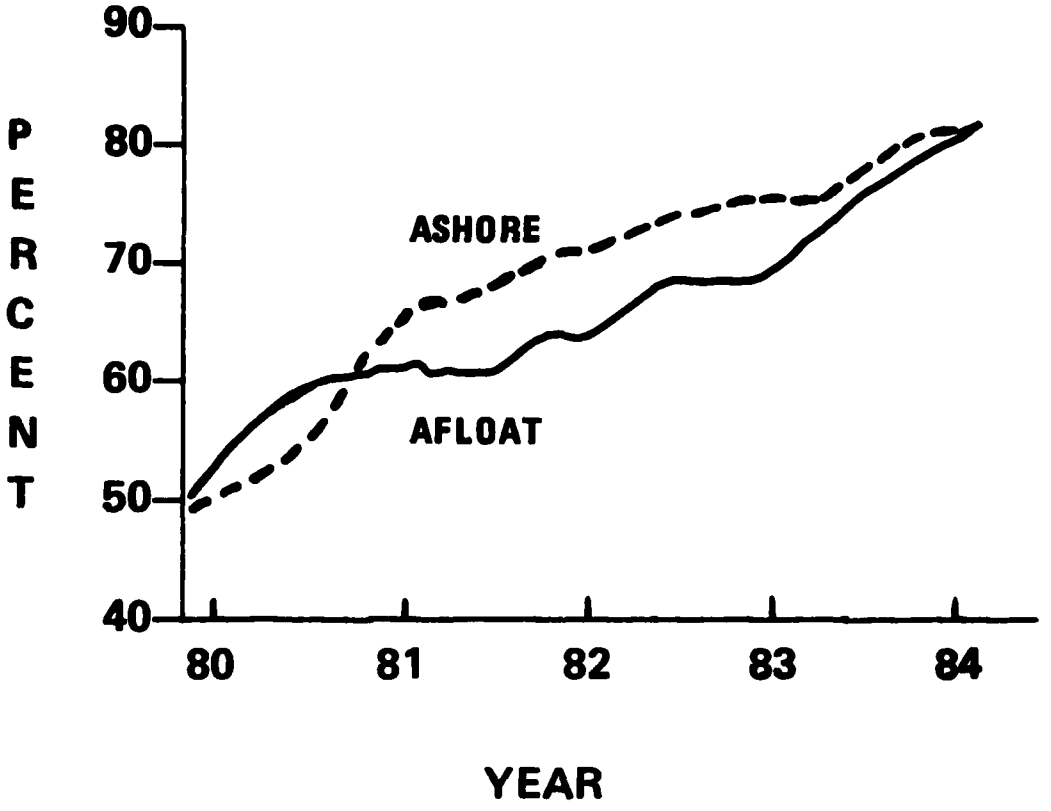

Figure 5. Dental readiness (personnel in classes 1 and 2), Naval Dental Clinic, Pearl Harbor, plotted for operational (afloat) and support (ashore) units. Total forces ashore = 11,100; total forces afloat = 11,200.

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Oral epidemiology
Automation
Combat readiness

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The effect of an automated dental recall and information system on dental readiness was evaluated over the four years of the system's implementation. Automation and the fleet/shore dental liaison which it facilitated, was deemed responsible for a 17.5 percent increase in the number of class 1 individuals and a 7.5 and 11.0 percent decrease in the number of class 3 and 4 individuals, respectively. These dental health findings equate directly with a higher state of personnel combat readiness.

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